

State of New Hampshire

Interdepartmental Memo

DATE: August 4, 2009

FROM: Paul Susca
Drinking Water and Groundwater Bureau (DWGB)
Department of Environmental Services

SUBJECT: Information Requested by the Surface Water Working Group

TO: Surface Water Working Group under the Source Water Protection Strategy Update

At the working group meeting on October 3, 2007, the group asked DWGB staff to pursue the ten items listed below, most involving information gathering, in preparation for the group's next meeting, which was scheduled to take place on January 16, 2008. As explained in emails to the group on December 20 and January 11, that meeting of the working group was postponed due to New Hampshire's selection in late December 2007 as one of three states to participate in the Land & Water project involving the Trust for Public Land and other national organizations.¹

Many of you participated in the kickoff meeting and/or the July 2008 workshops that were part of the Land & Water project, and I appreciate your contribution to that process. The Land & Water project finalized its action plan for New Hampshire in May 2009 (Attachment A). A number of action items in that plan are already being pursued, others involve raising money – for which this is not an opportune time – and others are based on assumptions that I believe should be examined, as noted in Proposed Action Items (Attachment J), before proceeding.

Below, I have listed the information requested by the working group; it is either included in the body of this memo or attached:

1. Possible opportunities for coordination with other programs and agencies.
2. Revise the list of surface water sources prepared before the previous meeting, double-check the accuracy of their protection status, and prepare a map to display the information.
3. Clarify the extent to which surfaces such as lawns are treated as impervious in DES rules.
4. Existing watershed management plans for surface water sources.
5. Examples of cooperation among towns on (non-water supply) watershed protection.
6. Information on the effectiveness of riparian buffers in removing specific contaminants
7. Massachusetts DEP's guidance on water supply watershed protection plans.
8. Anti-degradation policy as a means to protect surface water sources.

¹ More information about the Land & Water project is available at www.landuseandwater.org

9. Available cost-benefit information regarding source water protection.
10. Identify programs that focus on protecting riparian buffers through land acquisition or easements.

1. Possible opportunities for coordination with other programs and agencies

The Land & Water project focused on identifying such opportunities. Please see the action plan (Attachment A). Additional opportunities for coordination with other programs are discussed in the impervious areas memo (Attachment D) and in the discussion below of anti-degradation under Proposed Action Items.

2. Revise the list of surface water sources prepared before the previous meeting, double-check the accuracy of their protection status, and prepare a map to display the information.

A table is included as Attachment B; and a statewide map has been developed (Attachment I). **The updated table includes some information on protection of buffers that did not exist when the Working Group last met.** The “Buffer Protection” columns indicate the percentages of riparian buffers protected in various ways within each water supply watershed. As indicated in Attachment C (Table 1), Measuring Riparian Buffer Protection Within Water Supply Watersheds in New Hampshire, 59% of the stream and pond frontage in the state’s water supply watersheds is unprotected. Of the frontage that is protected, about half is protected through land conservation and one-third through the Comprehensive Shoreland Protection Act. Local zoning protects a relatively small percentage.

3. Clarify the extent to which surfaces such as lawns are treated as impervious in DES rules.

Please see Attachment D, a memo prepared by Pierce Rigrod. This memo contains a number of possible action items and the relevant background information.

4. Existing watershed management plans for surface water sources.

SOURCE SYSTEM	Plan Date	Comments
PENNICHUCK BROOK PENNICHUCK WATER WORKS	1998 2008	1998 Plan developed for PWW by consultant with limited stakeholder involvement, but PWW has steadily pursued watershed protection with additional study and implementation projects. PWW has also had limited success working with some watershed towns. DES’s Watershed Assistance Section funded the Pennichuck Brook Watershed Restoration Plan (2008); implementation currently underway in Tinker Brook subwatershed.

LAKE MASSABESIC MANCHESTER WATER WORKS	1999	MWW owns 8,000 acres of land along shore and in watershed. Plan developed for MWW by consultant without stakeholder involvement. MWW has since worked with recreation groups on access improvements and protection measures, worked with DES to update watershed protection rules, and has worked with City of Manchester and affected property owners to get zoning protection in place. Most recently, placed a 460 acre parcel in conservation easement. Currently updating forest management plan.
BERRY RIVER ROCHESTER WATER DEPT	2002	Conduct annual BMP inspections and educational mailings; pursuing implementation of SPCC measures at west end of Rochester Reservoir.
PAUGUS BAY LACONIA WATER WORKS	2000	City has pursued monitoring and stormwater retrofit projects, hired a Conservation/Planning Technician, and developed a stormwater policy addressing impervious area and BMPs.
DEARBORN BROOK AND RESERVOIR EXETER WATER DEPT	2004	Plan by RPC for Watershed Committee. Exeter Con Com and DPW have been implementing recommendations. Stratham has established a 25-foot no-disturbance buffer zone for wetlands.
EXETER RIVER EXETER WATER DEPT	1999	Exeter R. Corridor Mgmt Plan under RMPP being implemented. Work to date has identified subwatersheds for specific follow-up, including preparation of Watershed Based Management Plans, which will identify needed restoration actions including pollutant load reductions, stream bank restoration, BMPs, local regulatory review, etc. Driven by ERLAC and NHDES Coastal Program.
CANAAN ST LAKE CANAAN WATER DEPT	2006	Watershed entirely within Canaan. Plan by watershed AdCom with assistance from GSRWA. AdCom now pursuing follow-up with Plymouth State U. and UVLSRPC.
BEAR POND CONTOOCCOOK VILLAGE PRECINCT	2001	Plan prepared by consultant in consultation with watershed towns. This is a relatively pristine watershed; implementation efforts have focused on land conservation and working to accommodate recreation interests.
LAMPREY RIVER UNH/DURHAM WATER SYSTEM and NEWMARKET WATER WORKS	2007	The 1995 plan under the RMPP was revised in 2007.
CONTOOCCOOK RIVER CITY OF CONCORD	1994	Plan developed under RMPP. Very generic. Limited implementation.
LAKE WAUKEWAN MEREDITH WATER DEPT	2005	Plan developed by watershed AdCom with assistance from NHRWA. Extensive efforts made to include official representatives from all watershed towns on AdCom. AdCom has worked methodically to implement plan by working with towns, DES, DOT, DAMF, and Plymouth State U. Selected as pilot watershed for DES Watershed Approach.
OYSTER RIVER RESERVOIR UNH /DURHAM WATER SYSTEM	2001	Plan by Rockingham Planning Commission. VRAP ongoing.

5. Examples of cooperation among towns on (non-water supply) watershed protection.

The following information was provided by DES's Watershed Management Bureau. For a complete list of past and recent watershed based as well as plans currently under development, please see http://des.nh.gov/organization/divisions/water/wmb/was/watershed_based_plans.htm.

Beaver Lake Watershed Management Plan (Project B-04-M-13)

- Beaver Lake is situated in Derry, NH with the watershed occupying portions of Auburn, Chester, and Derry.
- The Beaver Lake Watershed Partnership formed through this project includes representatives from all three watershed towns. Representation from all three towns ensured that the goals, objectives, and activities developed in the watershed management plan were initiatives that would not only benefit the water quality and quantity of the watershed, but would extend into each of the master plans of Auburn, Chester, and Derry.
- Although the Beaver Lake watershed only occupies 29 acres of Auburn, the town representatives for that municipality have participated in the management plan process because they are able to apply watershed resource protection strategies developed as part of this project in their entire community.
- Another motivating factor for these three towns to work together on a watershed project is their common link with Pinkerton Academy. All three watershed towns send students to Pinkerton Academy, and the students and faculty of Pinkerton have played a huge role in the watershed management plan development. Pinkerton Academy will also be responsible for carrying on many of the resource inventorying, and watershed monitoring efforts established through this project.

Newfound Lake Watershed Master Plan Development and Implementation (Project B-07-M-01)

- The Newfound Lake watershed occupies portions of Bristol, Bridgewater, Hebron, Plymouth, Groton, Orange, and Alexandria.
- Project partners for this project include the above towns, Plymouth State University, UNH, and the Newfound Lake Region Association
- Presentations about this project have been made to all town planning boards and conservation commission with good feedback to date
- One of the deliverables being developed from this project is a matrix of existing planning and zoning rules for each of the towns. Some of the towns lack zoning regulations at this time. The watershed towns are motivated to work together on this project as they will benefit from the watershed planning effort and especially from the completion of the matrix. The goal is to try to align each of the towns with specific watershed zoning overlays designed to promote the concepts of low impact development, preservation of open space, and protection of water resources.
- Probably the largest motivation for these towns is the preservation of the economic stability in the Newfound region as many of the local businesses thrive from the pristine water quality of Newfound Lake and the surrounding streams and rivers in the region. If the towns work together on this project, that economic stability along with property values will be maintained into the future.

Upper Merrimack River Management and Implementation Plan

- The Upper Merrimack River Local Advisory Committee (UMRLAC) is one of 14 local advisory committees in New Hampshire charged with developing a corridor management and implementation plan for their designated river as established under the DES Rivers Management and Protection Program.

- The UMLAC has representation from Boscawen, Bow, Canterbury, Concord, Franklin, and Northfield.
- UMLAC representatives are elected by their town or city to serve on UMLAC to represent a variety of interests relative to protection of natural resources within the designated river corridor
- The UMLAC manages a river quality monitoring program known as the Upper Merrimack Monitoring Program (UMMP). This successful river monitoring effort draws upon volunteers from all the towns along the corridor to implement key actions required for monitoring the biological, physical, and chemical health of the Upper Merrimack, Pemigewasset, Winnepesaukee, and Contoocook Rivers from Franklin to Bow.
- The UMLAC instituted a municipal support program several years ago that established a mechanism for generating funding support from each of the corridor municipalities based upon a per capita scale. Each corridor community now supports the efforts of the UMMP on an annual basis to cover the costs of laboratory and equipment fees that are incurred.
- UMLAC representatives from each municipality typically make presentations to the boards responsible for providing the financial support on an annual basis. This provides the town or city with an opportunity to hear from their designated UMLAC representative(s) on the activities carried out by UMLAC and UMMP. Verification of expenditure of municipal funding is also achieved through this activity.
- The motivation for these communities to indirectly work with the UMLAC and the UMMP is the common goal of surface and ground water protection within the Upper Merrimack River corridor as it directly relates to municipal water supplies, wastewater discharge capacity, and support of designated uses on the river segments in this corridor.

Acton Wakefield Watersheds Alliance (AWWA) Watershed Based Plan for the Salmon Falls Headwaters Region

- The AWWA plan will include five lakes (Great East Lake, Lake Ivanhoe, Horn Pond, Wilson Lake, and Lovell Lake) in the towns of Wakefield, NH and Acton, ME.
- Project partners for this project include AWWA, the towns, UNH, ME DEP, and NH DES.
- Presentations about the project have been made to both town planning boards, selectmen, and conservation commissions in both towns with good feedback to date
- The project partners are conducting watershed modeling and a build-out analysis. The results will be used to set phosphorous thresholds for each lake. The thresholds will serve as a “guidance” value that the towns and AWWA can use to develop lake management strategies to protect and maintain water quality.
- One of the deliverables being developed from this project is a matrix of existing planning and zoning rules for each of the towns. This information will be used in conjunction with results from the modeling and build-out analysis to determine management recommendations (including regulations) to reduce phosphorous loading to the lakes.
- The largest motivation for this cooperative, regional effort is the preservation of the pristine water quality of the region’s lakes and surrounding streams and rivers. The towns anticipate that by working together on this project, economic stability and property values will be maintained into the future.

Exeter River Geomorphic Assessment and Watershed-based Plan

- The Exeter River Local Advisory Committee (ERLAC), whose membership includes representatives from 15 communities in the Exeter River watershed, is working with NNNH DES to assess fluvial geomorphic and habitat conditions in the Exeter River watershed.
- Results from the assessment will be used to develop a watershed restoration and protection plan.
- A geomorphic-based approach was selected because it provided a holistic watershed-scale approach to identifying stressors on river ecosystem health.
- The Plan will provide local and regional recommendations for restoration and protection including land conservation, best management practices, regulatory approaches, riparian buffer protection and restoration, hazard mitigation and outreach.
- Towns in the watershed will work together with ERLAC and NH DES to implement the recommendations.

Willand Pond Restoration Plan

- The cities of Dover and Somersworth are working with NH DES, SW Cole, Taylor and Associates, and Horsley Witten to develop a restoration plan to address water quality and quantity issues in Willand Pond.
- The project is a cooperative effort of both municipalities, local landowners, and NH DES. Project tasks include water quality and hydrologic analysis.
- Recommendations for restoration actions, BMPs, and regulatory approaches will be provided in a restoration plan that the cities will implement.

6. Information on the effectiveness of riparian buffers in removing specific contaminants

Please see Attachment E, a memo prepared by Mark Nelson of Horsley & Witten, Inc. for NHDES. The memo summarizes the available research regarding the effectiveness of vegetated riparian buffers in removing from runoff the following nutrients and pollutants of concern: nitrogen, phosphorus, sediment, salt, metals, and pathogens. To summarize the memo: the effectiveness of vegetated buffers varies according to the contaminant of concern and various site-specific factors such as soil type, slope, and vegetation. Vegetated buffers can be effective for some nutrients/contaminants but not others; hence a combination of strategies (e.g. source reduction and various stormwater management techniques) needs to be employed to address all contaminants. Nutrients/contaminants for which buffers can be effective: sediment, sediment-bound phosphorus (short-term), nitrogen in runoff, metals, and pathogenic viruses. Those for which buffers are not effective: phosphorus (long-term), nitrogen in the subsurface (e.g., from septic systems), and salt. Recommended buffer widths for various contaminants range from 25 to 300 feet; a conservative buffer width for multiple contaminants would be 300 feet (although it probably makes more sense to have a variable width based on site-specific factors), again keeping in mind that other strategies need to be employed as well. Attachments F through H provide additional information compiled by Horsley & Witten with respect to the use of buffers and other approaches to protecting surface water sources.

The buffer gap analysis prepared by DES followed from the Horsley & Witten work. For a summary of the results of the buffer gap analysis, please see Attachment C.

7. Summary of Massachusetts DEP's Guidance on Water Supply Watershed Protection Plans

The complete 18-page guidance document, *Developing a Local Surface Water Supply Protection Plan* (MA Department of Environmental Protection, 2000), is available through the Internet at <http://www.mass.gov/dep/water/drinking/surfprot.doc>.

“This guidance document outlines the minimum components which should be included in a local Surface Water Supply Protection Plan for filtered reservoirs, provides a step-by-step approach to water supply protection planning, and gives examples of local protection options.” The guidance recommends following four steps to develop a plan:

1. Delineate – The document lists the types of features that should be mapped within the watershed area, such as water resources and existing protection areas, existing land uses and potential contamination sources, protected open space, and local zoning.
2. Inventory – This involves assessing the impacts of activities and land uses mapped in the first step. (NHDES's Drinking Water Source Protection Program would consider many of the mapping activities to be part of the inventory process, but what matters is that the steps are the same as what we normally recommend.) This also include a water quality monitoring effort.
3. Protect – This includes identifying actions that need to be taken, and implementing those actions according to a timetable (what NHDES's DWSPP refers to as planning and implementation). This includes land conservation, improved management of municipal lands and facilities, possible restrictions on water-based recreation,
4. Educate

The document is also sprinkled with capsule case studies that illustrate the various approaches used by water suppliers and municipal officials to implement watershed protection plans.

8. Anti-Degradation Policy to Protect Surface Water Sources

Under the Federal Clean Water Act, every state must adopt an anti-degradation policy to maintain and protect high quality waters. *The state's anti-degradation policy triggers a regulatory review of pollutant loading and water quality degradation impacts whenever a project requires a federal permit or certification; this includes activities such as wastewater discharges, wetland alteration, significant alteration of terrain, or disturbance of an acre or more (because this requires the filing of a Notice of Intent under the NPDES Stormwater Phase II Construction General Permit).* DES is about to draft changes to its anti-degradation rules with a view to improving protection of high-quality waters, including water supply sources. One way to afford enhanced protection for certain water bodies is to designate them to an anti-degradation “Tier.” From lowest to highest quality, New Hampshire recognizes four tiers:

- Impaired (fails to support one or more designated uses) – No further degradation allowed and eventually water quality must be improved to meet water quality criteria and support designated uses.
- Tier I – Supporting designated uses but with limited (less than 10%) capacity remaining to assimilate additional pollutant loadings and therefore no further degradation allowed.
- Tier II – High quality waters, having significant capacity to assimilate additional pollutant loadings without becoming impaired. Insignificant degradation is allowed, but *significant degradation can occur only after a public review process that includes social and economic justification as well as an alternatives analysis.*
- Tier III – From a national perspective, Tier III (which reflects the level of protection and not necessarily the actual water quality) is typically reserved for waters that are outstanding national resource waters. No degradation of water quality except short-term, temporary degradation is allowed in Tier III waters. In New Hampshire, river segments that are designated Natural under the Rivers Management and Protection Program (RMPP), as well as waters in the White Mountain National Forest, are considered Outstanding Resource Waters and therefore receive Tier III protection. Others could be designated by rule. While none of the RMPP-designated Natural segments is near a water supply intake, several water supply intakes are located in the White Mountain National Forest (please see attached list of surface water sources), and therefore receive Tier III protection.

Some states apply anti-degradation only to new point sources. New Hampshire rules apply anti-degradation to both nonpoint and point source discharges. To provide enhanced protection for water supply sources, some states, including Massachusetts, also establish an additional category, Tier II ½, which is designed to maintain existing water quality, but is more flexible than Tier III.

New Hampshire anti-degradation rules provide a different approach to protecting high-value and sensitive waters. Under DES's anti-degradation rule, projects affecting Tier II waters would be viewed as either significant or insignificant in terms of the extent to which they would degrade water quality. *Significant* projects would be required to demonstrate social and economic benefit to justify degradation of water quality and conduct an alternatives analysis to show that the degradation is necessary, with substantial public participation in the review process. Insignificant projects would involve none of these. Typically, significant projects are so classified based on their pollutant loading and use of remaining assimilative capacity, but under the approach in the anti-degradation rules, *even projects that are insignificant in terms of their pollutant loading would be treated as significant if they would affect the use of sensitive or high-value waters such as water supply sources.* The rationale for this approach is that the in-depth review required for significant projects provides an appropriate level of protection for sensitive or high-value waters. *Either the state or local groups could initiate the process of designating waters into the sensitive/high-value category.*

DES's Watershed Management Bureau is working with the Water Quality Standards Advisory Committee to develop rule changes that will facilitate the use of this approach, with a view to adoption in approximately two years. In the meantime, DES is in the process of identifying Tier

II waters, intending to list them in its biennial Surface Water Quality Assessment Report (305(b) Report and 303(d) List) to USEPA beginning in 2010.

9. **Available cost-benefit information regarding source water protection.**

While a number of studies have examined the avoided costs associated with protection of groundwater sources, little work has been done to quantify the avoided costs associated with protecting surface water sources. However, “[a] study of 27 water suppliers conducted by the Trust for Public Land and the American Water Works Association in 2002 found that more forest cover in a watershed results in lower treatment costs. According to the study, for every 10 percent increase in forest cover in the source area, treatment and chemical costs *decreased* approximately 20 percent, and approximately 50 to 55 percent of the variation in treatment costs can be explained by the percentage of forest cover in the source area.”² A 1997 study by the Department of Agricultural Economics at Texas A&M University, which looked at 12 geographically representative water suppliers over three years, found that treatment costs increased one percent for every four percent increase in raw water turbidity.³

More recently, a 2005 report on collaboration between water utilities and agricultural producers by the AWWA Research Foundation found that, “Investment in source protection is in some cases more cost-effective than investment in treatment. This is most clear when the capital or operating costs associated with not protecting source waters is high . . . Source protection can logically be expected to be more cost-effective than investment in treatment in less extreme cases as well; however, demonstrating this is non-trivial, more prone to uncertainty, and necessarily done on a case-by-case basis.”⁴

Another way of looking at the cost of failing to protect water sources and to adequately treat water is the cost of illness. A recent review by scientists from the U.S. EPA estimated that 16.4 million (with a 95% credible interval of 5.5 to 32.8 million) cases of *acute gastrointestinal illness* per year are attributable to *community drinking water systems* in the United States.⁵ “Even a mild case of diarrhea costs an estimated \$280 in lost work productivity and over-the-counter medicines. More severe episodes can cost \$8,000 per person for medical diagnosis and treatment.”⁶

The Water Research Foundation (formerly Awwa Research Foundation) is currently developing an on-line calculator to help users estimate the “triple bottom line” (financial, social, and environmental) benefits and costs of source water protection programs. The tool will be tested

² Ernst, Caryn, 2004. *Protecting the Source, Land Conservation and the Future of America's Drinking Water*. The Trust for Public Land. Pp 21-22.

³ Ernst, 2000. p 22.

⁴ Fletcher, Angie and Susan Davis, 2005. *Water Utility/Agricultural Alliances: Working Together for Cleaner Water*. Awwa Research Foundation and American Water Works Association, Denver CO. p 45.

⁵ Messner, M, et. al., 2006. An approach for developing a national estimate of waterborne disease due to drinking water and a national estimate model application, *Journal of Water and Health* 04.Suppl 2, pp 201-240.

⁶ American Society for Microbiology, (1999). *Microbial Pollutants in Our Nation's Water – Environmental and Public Health Issues*. p 6.

this year and is expected to be available by the end of 2009. Manchester Water Works is one of the participants in the project.⁷

10. Identify programs that focus on protecting riparian buffers through land acquisition or easements

Research by Holly Green, coordinator of NHDES's Water Supply Land Protection Grant (WSLPG) Program attempted to identify such programs, but did not find any. There are many land conservation programs throughout the country, many with a focus on water resources protection and water supply protection in particular, and riparian buffer protection is often a criterion used in these programs, but no programs were found where riparian buffer protection is the only criterion.

Several New Hampshire state programs give some weight to riparian buffer protection already, including NHDES's Water Supply Land Protection Grant Program, the Fish and Game Department's Landowner Incentive Program, and the Department of Resource and Economic Development's Land and Water Conservation Fund Program.

Since the working group last met, NHDES has amended the rules governing the Water Supply Land Protection Grant Program, including changes to the application scoring scheme that will award points for riparian frontage.

Attachments:

- A – Action Plan from Land & Water Project (May 2009)
- B – List of Surface Water Supply Sources and Protection Status
- C – Measuring Riparian Buffer Protection Within Water Supply Watersheds in New Hampshire (10/21/2008)
- D – Memo from Pierce Rigrod, NHDES (4/13/09) regarding impervious areas
- E – Memo from Mark Nelson, Horsley & Witten (1/26/07, rev. 5/17/07), Benchmark uniform minimum shoreland buffer width for the protection of N.H. surface drinking water sources
- F – Proposed draft buffer matrix prepared by Horsley & Witten
- G – Memo from Mark Nelson, Horsley & Witten (3/13/07, rev. 5/17/07), Protecting New Hampshire Surface Drinking Water Supplies, Identify and Evaluate Alternatives of the Minimum Buffer Approach
- H – Memo from Mark Nelson, Horsley & Witten (9/14/07), Example Strategies for Surface Water Supply Protection
- I – Map: Protection Status of Water Supply Watersheds
- J – Proposed Action Items (and Rationale) for Surface Sources, Source Water Protection Strategy Update (August 2009)

⁷ Henderson, Jim, 2008. Source Water Protection Benefit-Cost Tool. AWWA Water Resources Symposium, Portland OR, January 27, 2008.